

Maternal and Neonatal Outcomes among Teenage Pregnancy between Pre and COVID-19 Pandemic: A Thailand Rural Hospital Case 2017-2022

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Objective: To investigate the impact of the COVID-19 pandemic on teenage pregnancy, including the prevalence of preterm birth, maternal and neonatal outcomes, and associated complications.

Materials and Methods: A comparative retrospective study was conducted at Nakhon Nayok General Hospital's Department of Obstetrics and Gynecology in Thailand. The present study focused on teenage pregnancies delivered between January 2017 and December 2022. Subjects were divided into two groups, a control group, consisting of deliveries between 2017 and 2019, and a study group, encompassing deliveries between 2020 and 2022.

Results: There were 566 cases in the study group and 644 cases in the control group, resulting in an overall teenage pregnancy prevalence of 13.9%, or 1,230 out of 8,811 deliveries. The mean age of participants was 17.4 years. Demographic characteristics between both groups were comparable. Preterm birth was observed in 11.8% of all teenage pregnancies, with a lower preterm birth rate in the study group compared to the control group at 9.5% versus 13.8%, respectively, and this difference was statistically significant. The rates of cesarean delivery, low birth weight (LBW), and stillbirth did not change significantly before and during the COVID-19 pandemic. At the postpartum, the study group displayed a preference for long-acting reversible contraception (LARC) methods, with 83% choosing LARC, compared to 75.6% in the control group ($p=0.001$).

Conclusion: During the COVID-19 pandemic, the rate of preterm births among teenage pregnancies decreased. Additionally, there was an increase in the preference for LARC methods among teenage pregnancy cases.

Keywords: Teenage pregnancy; COVID-19; Pregnancy outcome; Contraception

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The World Health Organization (WHO) declared the outbreak of COVID-19 on January 30, 2020. By March 11, 2020, it was announced as a public health emergency of international concern, reaching pandemic proportions⁽¹⁾. In Thailand, COVID-19 was designated as a dangerous communicable disease according to the Thai Communicable Diseases Act of 2015⁽²⁾. COVID-19 is primarily transmitted

from person to person via airborne and droplets. Symptoms range from asymptomatic to severe respiratory infections. Pregnancy is associated with a compromised immune status, and cases of morbidity and mortality in both fetuses and mothers have been reported in pregnant women with COVID-19 infection⁽³⁻⁷⁾.

Teenage pregnancy refers to pregnancy in women aged between 10 and 19 years old⁽⁸⁾. Report from Thai Ministry of Public Health in year 2021 revealed that childbirth rate in adolescent women, aged between 15 and 19 years old, was 24.4 per 1,000 cases⁽⁹⁾. High prevalence of cesarean delivery, preterm, hypertensive disorder in pregnancy, anemia, neonatal morbidity, and sexually transmitted disease (STD) infection were observed among teenage pregnancies⁽¹⁰⁻¹²⁾.

During the COVID-19 pandemic, access to hospital services and antenatal care (ANC) in Thailand was limited due to infection control

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measures. Data on COVID-19 infections among teenage pregnancies in Thailand were scarce. The aim of the present study was to investigate the impact of the COVID-19 pandemic on teenage pregnancies and preterm births, including the prevalence of preterm births, maternal and neonatal outcomes, and associated complications in rural settings.

Materials and Methods

The present study was a comparative retrospective study. Data were collected from the Department of Obstetrics and Gynecology, Nakhon Nayok Hospital, Nakhon Nayok province, Thailand. The study was approved by the Ethics Committee of Nakhon Nayok Hospital (IRB 04/2566). Subjects were teenage pregnancies who delivered their babies between January 2017 and December 2022 at Nakhon Nayok Hospital.

Inclusion criteria were singleton teenage pregnancies with a maternal age of 10 to 19 years at date of delivery, delivering their babies during the study period. Exclusion criteria were twin pregnancy and neonates with chromosomal or structural anomalies. Subjects were divided into the study and the control groups. The study group consisted of teenage pregnancies delivered during COVID-19 pandemic, or between January 2020 and December 2022. Teenage pregnancies who delivered before COVID-19 pandemic were classified as control group, which they delivered between January 2017 and December 2019.

Data were retrieved from the electronic medical record of Nakhon Nayok Hospital database. Demographic characters included age, body mass index (BMI), and total number of ANC visits. Clinical characters and complication of participants and their neonates were also recorded. The flow chart of the study is presented in Figure 1.

From the data in Thailand during 2021, the prevalence of preterm among teenage pregnancy was 14.9%⁽¹³⁾. The sample size for the current study was at least 543 cases. Alpha error was set at the level of 0.05. Ten percent compensation was added. Subjects in the current study were chosen at 600 cases per group.

For descriptive statistics, data were reported in mean, percentage, and standard deviation (SD). The student t-test and chi-squared test were used to analyze demographic data. A p-value less than 0.05 was considered statistically significant. Statistical analysis was performed by using IBM SPSS Statistics, version 21.0 (IBM Corp., Armonk,

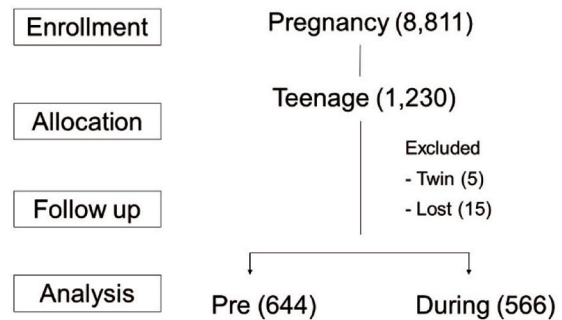


Figure 1. Flow chart of study.

Pregnancy: pregnant women between 2017 and 2022, Teenage: pregnancy age less than 19 years old, Pre: pregnancy before COVID-19 pandemic (2017-2019), During: pregnancy during COVID-19 pandemic (2020-2022)

NY, USA). Univariable logistic regression models were employed to assess the relationship between each independent variable and the preterm delivery. The significance of associations was evaluated based on p-value, with a threshold set at below 0.1. Multivariable logistic regression analysis was then conducted, incorporating the variables identified in the univariable phase. The level of statistical significance for the multivariable analysis was set at p-value less than 0.05.

Results

During the study period, 566 and 644 subjects were recruited into the study and control groups, respectively. The mean age of subjects was 17.4 years old. Teenage pregnancy in all subjects in the present study was 13.9% (1,230/8,811) of all mothers delivering babies at Nakhon Nayok Hospital. Teenage pregnancy in the study and control groups were 12.8% and 14.7%, respectively, with no statistical significance. Average BMI of subject was 25.8 kg/m². Three-quarters of subjects were housewives and students. More subjects in the study group reported living with a partner compared to those in control group with statistical significance at 94% and 88%, respectively (p=0.002). Ninety-one and 86% of parturients in the study and the control group were nulliparous, respectively (p=0.002). Number of cases with smoking, drug abuse, alcoholic consumption, hepatitis B, and HIV infection rate of both groups were comparable as shown in Table 1. The study group had a higher number of syphilis infected individual compared to the control group at 6.4% and 0.5% (p<0.001).

For obstetric complication, namely gestational diabetes mellitus (GDM), preeclampsia, and fetal

Table 1. Clinical characteristics of adolescent mothers between pre and during COVID-19 pandemic

	Pre (n=644)	During (n=566)	p-value
Age (years); mean±SD	17.4±1.4	17.4±1.5	0.268
BMI (kg/m ²); mean±SD	25.9±4.9	26.0±5.2	0.696
Occupation; n (%)			0.317
House wife & students	521 (80.9)	438 (77.4)	
Officer worker/employed	123 (19.1)	128 (22.6)	
Married status; n (%)	569 (88.4)	529 (93.5)	0.002
ANC ≥8 visits; n (%)	429 (66.6)	347 (61.3)	0.112
Hb (g/%) ; mean±SD	12.5±1.2	11.4±1.2	0.038
Drug abuse & smoking; n (%)	4 (0.6)	9 (1.6)	0.10
Alcohol drinking; n (%)	2 (0.3)	6 (1.1)	0.105
HBS Ag positive; n (%)	4 (0.6)	1 (0.2)	0.23
HIV positive; n (%)	7 (1.1)	4 (0.7)	0.487
Syphilis positive; n (%)	3 (0.5)	36 (6.4)	<0.001
Nulliparity; n (%)	555 (86.2)	518 (91.5)	0.002

SD=standard deviation; BMI=body mass index; ANC=antenatal care; Hb=hemoglobin level; HBS Ag=hepatitis B surface antigen; HIV=human immunodeficiency virus

growth restriction (FGR), the rate of both groups were comparable as presented in Table 2. The prevalence of preterm among all teenage pregnancies was 11.8%. Cesarean delivery rate of study and control groups were 29% and 32%, respectively without statistical significance. The preterm birth rate of the study group was lower than the control group with statistical significance at 9.5% and 13.8%, respectively. Obstetric hemorrhage, neonatal outcome, namely fetal birth weight, birth asphyxia, and neonatal intensive care unit (NICU) admissions of the study and the control groups were comparable. The control group had a higher percentage of postpartum visit at six weeks than the study groups with statistical significance of 40.2% and 26.1% in respective order (p<0.001). The study group preferred the choice of long-acting reversible contraception (LARC) method after childbirth compared to those in the control group at 83% and 75.6%, respectively (p=0.001).

From univariable analysis, BMI higher than 25 kg/m², less than eight ANC visit, no ANC visit, married status, drug abuse, and GDM were associated risk factors for preterm delivery in the present study. Reduction factors for preterm were BMI higher than 25 kg/m² and married status. No ANC visit, less than eight ANC visits, drug abuse, and GDM were increasing factors. After multivariable analysis calculation, only BMI of more than 25 kg/m² was reducing factor for preterm (adjusted OR 0.61). While less than eight ANC visit and GDM were associated

Table 2. Obstetric complications and management between pre and during COVID-19 pandemic

	Pre (n=644) n (%)	During (n=566) n (%)	p-value
GDM	8 (1.2)	3 (0.5)	0.193
Preeclampsia	12 (1.9)	15 (2.7)	0.355
Obstetrics hemorrhage	12 (1.9)	14 (2.4)	0.465
Anemia	51 (7.9)	23 (4.1)	0.005
PROM	14 (2.2)	9 (1.6)	0.458
Corticosteroid usage	72 (11.2)	48 (8.5)	0.117
Tocolytic usage	71 (11.0)	47 (8.3)	0.111
Chorioamnionitis	1 (0.2)	1 (0.2)	0.717
FGR	44 (6.83)	31 (5.5)	0.322
Vaginal delivery	444 (68.9)	405 (71.6)	0.322
Preterm	89 (13.8)	54 (9.5)	0.021
Neonatal outcome			
FBW (g); mean±SD	2947.2±472.7	2975.5±453.9	0.290
LBW	80 (12.4)	55 (9.7)	0.135
Birth asphyxia	2 (0.3)	3 (0.5)	0.440
Still birth	5 (0.8)	2 (0.4)	0.282
NICU admissions	59 (9.2)	53 (9.4)	0.903
Follow up postpartum care	259 (40.2)	148 (26.2)	<0.001
LARC	487 (75.6)	470 (83.0)	0.001

SD=standard deviation; GDM=gestational diabetes mellitus; PROM=premature rupture of membranes; FGR=fetal growth restriction; NICU=neonatal intensive care unit; FBW=fetal birth weight; LBW=low birth weight; LARC=long-acting reversible contraception

with increased risk for preterm delivery (adjusted OR 5.26 and 10.53, respectively) as shown in Table 3.

Eight subjects had COVID-19 infection during the time of delivery. Cesarean delivery was performed on seven of those. One successfully gave birth by vaginal delivery. COVID-19 PCR were performed on the eight neonates immediately after birth and all yielded negative result. None of those eight babies showed neonate complication.

Discussion

The present study was conducted between pre and during COVID-19 pandemic. The mean age and demographic character of teenage pregnancy were comparable between both periods. Three percent of the pre COVID-19 group were younger than 15 years of age. This was the same percentage of less than 15 years old pregnant mothers during the pandemic.

The number of recommended ANC visits for pregnant women was at least eight times, per Centers for Disease Control and Prevention (CDC) and Ministry of Public Health (MOPH)^(14,15). During COVID-19 pandemic, the percentage of recommended ANC visits, which was more than eight

Table 3. Univariable and Multivariable of associate preterm factors

	Univariable analysis			Multivariable analysis		
	Crude odd ratio	95% CI	p-value	Adjusted odd ratio	95% CI	p-value
Age <15 years	1.61	0.70 to 3.72	0.261			
BMI \geq 25 kg/m ²	0.58	0.41 to 0.83	0.003	0.61	0.42 to 0.90	0.013
BMI \geq 30 kg/m ²	0.74	0.45 to 1.22	0.24			
Married status	0.51	0.30 to 0.84	0.008	0.61	0.36 to 1.06	0.08
No ANC	6.76	2.97 to 15.40	<0.001	2.28	0.93 to 5.63	0.073
ANC <8 times	5.71	3.87 to 8.41	<0.001	5.26	3.52 to 7.86	<0.001
Drug abuse	10.22	2.26 to 46.12	0.003	4.52	0.73 to 27.82	0.104
Smoking	3.77	0.68 to 20.79	0.127			
Alcohol drinking	2.51	0.50 to 12.56	0.262			
HBS Ag	1.87	0.21 to 16.88	0.576			
HIV	0.75	0.09 to 5.83	0.78			
Syphilis	0.85	0.30 to 2.46	0.76			
GDM	4.36	1.26 to 15.09	0.02	10.53	2.76 to 40.12	0.001

CI=confidence interval; BMI=body mass index; ANC=antenatal care; HBS Ag=hepatitis B surface antigen; HIV=human immunodeficiency virus; GDM=gestational diabetes mellitus

visits, in teenage mothers between pre and during COVID-19 pandemic were comparable at 53.9% and 66.6%, respectively.

Government protocol for controlling COVID-19 was to strictly quarantine most people at their home during the height of the pandemic. It consisted of encouragement for businesses to ask their employees to work from home, keeping personal social distance, wearing mask, children studying online at home, and strict personal hygiene. Hospitals in Thailand announced reduction of non-emergency services across the board. This might explain the reduction of ANC visits of teen mothers during COVID-19 pandemic. In addition, the decrease in number of ANC visits were also reported from other studies. Goyal stated that only two-third pregnant women during pandemic era achieved adequate ANC visit level. The difficulty in finding transportation and possible exposure to COVID-19 infection were the cause of inadequacy of ANC visits⁽¹⁶⁾. Another study from Ethiopia in 2021 showed that the number of ANC visit during the four months period of 2020 was lower than the same period in 2019 with 694.75 and 943.25 visits, respectively. The reason for the inadequacy of ANC was the difficult health care accessibility⁽¹⁷⁾. The result from the current study was not in line with the study from India and Ethiopia^(16,17). Difficulty of finding transportation to antenatal clinic was reported to be the major problem that interfered with pregnant women attending ANC.

The present study found that the percentage of preterm births during the COVID-19 period

was significantly lower than before the COVID-19 pandemic. However, there was no significant difference in the rates of low birth weight (LBW) and stillbirth between the pre-COVID-19 and during COVID-19 period. The decrease in the preterm birth rate aligns with previous studies conducted in England, Denmark, and Türkiye⁽¹⁸⁻²⁰⁾. However, a study from France in 2021 reported no significant difference in the prevalence of preterm births before and during the COVID-19 period, and the reasons for this lack of difference remain unexplained⁽²¹⁾. The adoption of a social distancing lifestyle might have contributed to better self-care among pregnant teenage mothers. They no longer had to commute to school and could spend more time at home, resulting in a less stressful environment.

The prevalence of teenage pregnancy in all subjects in the present study was 13.9%, compared to 15.2% in a previous Thai study in Phitsanulok, northern Thailand, in 2016⁽²²⁾. The rural setting of Nakhon Nayok community, where everyone knew one another, might encourage conservative sexual conduct among teenagers in the present study area. The percentage of teenage pregnancy in the current study at Nakhon Nayok Hospital did not change between the pre-COVID-19 period, which was 14.7%, and the during COVID-19 period, which was 12.8%. This finding was consistent with the previous studies from England⁽¹⁸⁾. However, a study in Ethiopia had contrasting results⁽¹⁷⁾. In Thai culture, young girls typically live with their parents. Online learning at home with parental supervision might have prevented

Table 4. Comparison of the previous literatures of pre and during COVID-19 to the current study

Author	Present		Gurol-Uraganci		Mølholm		Garabedian		Yalçın		Kassie	
Year	2023		2022		2022		2021		2022		2021	
Country	Thailand		England		Denmark		France		Türkiye		Ethiopia	
Design	R		R		C		R		R		C	
Preterm	13.8*	9.5*	6.1*	6.0*	6.3*	6.0*	6.9	7.5	8.0*	6.0*		
Teenage	14.7	12.8	2.9	2.7					3.5*	4.2*	7.5*	13.1*
CS rate	31.1	28.5	17.0*	18.4*					57.7*	60.2*	9.3*	13.7*
LBW	12.4	9.7	5.8*	5.6*	10.4*	9.0*	12.0	12.8	8.0*	7.7*		
Stillbirth	0.8	0.4	0.4	0.4			0.5	0.5			14.0*	21.8*

R=retrospective; C=cross sectional; CS=cesarean delivery; LBW=low birth weight

* Statistical significance

conditions that could lead to increased sexual activity. Reports suggested that the data came from countries where young girls have early marriages, such as India and Ethiopia^(16,17). The trend of decreasing teenage pregnancy prevalence in the present study aligned with the study from England⁽¹⁸⁾. However, there was no statistically significant difference in teenage pregnancy prevalence.

The cesarean rate of teenage mothers in the current study during COVID-19 pandemic did not differ from pre COVID-19 pandemic period. This result was inconsistent with most previous studies^(17,18,20). The current study found 0.9% of mothers with COVID-19 infection gave birth in Nakhon Nayok hospital. During labor, the pushing of the fetus through the birth canal in the second stage of labor created hazard environment from respiratory environment in COVID-19 infected mothers. COVID-19 virus could be expelled from parturient into the air of the birthing theatre. Negative pressure labor room and airborne protection suite for medical personals were needed for the handling of COVID-19 infected birthing mother. However, the present study facility did not have any negative pressure birthing theatre throughout the COVID-19 pandemic period. Most physicians preferred to do cesarean delivery among COVID-19 infected parturient⁽²³⁾. The trend of increase cesarean delivery rate was reported from England, Türkiye, and Ethiopia^(17,18,20). The present investigation was done in rural area of Thailand. The travelling from home to hospital took longer time than those reported from big cities dweller. During the study period, 12.5% (1/8) of COVID-19 infected parturient had spontaneous delivery shortly after admission because it took her a long time to arrange the travel to the hospital to give birth.

The most popular contraception method after birth chosen by the present study parturient was

the LARC. LARC was implanted in parturient after the delivery. The present study showed more percentage choice for LARC use during COVID-19 pandemic compared to pre-pandemic time at 83% and 75.6%, respectively. National Health Security Office of Thailand (NHSO) had been promoting a free use of selected temporary contraception to all since 2014⁽²⁴⁾. Mothers who chose LARC did not have to pay anything thus the choice became quite popular. Comparison between pre COVID-19 and COVID-19 pandemic work in the United States, the uses of LARC were lowered from 19.6% to 13.5% during the COVID-19 pandemic, respectively⁽²⁵⁾. The reason behind this finding was that the postpartum visit cannot be held during pandemic situation. The U.S. health insurance did not cover the cost of LARC. Strength of the current study were the large number of teenage pregnancy outcomes among pre and during COVID-19 pandemic and data coverage until postpartum period. Retrospective design was the limitation of the current study. It could not present specific reasons for the decrease of preterm birth rate and enough data for analysis. This was a gap of knowledge for next study.

Conclusion

During COVID-19 pandemic, the rate of teenage pregnancy, LBW, stillbirth, and cesarean delivery did not change. The preterm birth rate was significantly decreased during COVID-19 pandemic. The most popular contraception among teenage parturient during COVID-19 pandemic was LARC.

What is already known on this topic?

Pregnancy is considered a low immunity status. Pregnant women with COVID-19 infection resulted in morbidity and mortality in both fetus and mothers. High prevalence of cesarean delivery,

preterm, hypertensive disorder in pregnancy, anemia, neonatal morbidity, and STD infection were reported among teenage pregnancies during pre-COVID-19 pandemic. During COVID-19 pandemic, reduction of teenage pregnancy, preterm birth, LBW, and stillbirth were reported from studies.

What does this study add?

Preterm birth rate decreased during COVID-19 pandemic. Teenage pregnancy, cesarean delivery, LBW and stillbirth were comparable. Long active reversible contraception was more popular during COVID-19 pandemic than in the pre COVID-19 pandemic.

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Conflicts of interest

The authors declare no conflict of interest.

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